

# LH5316000

CMOS 16M ( $2M \times 8 / 1M \times 16$ )  
Mask-Programmable ROM

## FEATURES

- $2,097,152 \times 8$  bit organization (Byte mode)  
 $1,048,576 \times 16$  bit organization (Word mode)
- $\overline{\text{BYTE}}$  input pin selects bit configuration
- Access time: 200 ns (MAX.)
- Power consumption:  
Operating: 275 mW (MAX.)  
Standby: 550  $\mu$ W (MAX.)
- Fully static operation
- TTL compatible I/O
- Three-state outputs
- Single +5 V power supply
- Packages:  
64-pin, 750-mil SDIP  
64-pin,  $14 \times 20$  mm<sup>2</sup> QFP
- X16 word-wide pinout

## DESCRIPTION

The LH5316000 is a mask-programmable ROM organized as  $2,097,152 \times 8$  bits (Byte mode) or  $1,048,576 \times 16$  bits (Word mode) that can be selected by an input pin. It is fabricated using silicon-gate CMOS process technology.

## PIN CONNECTIONS

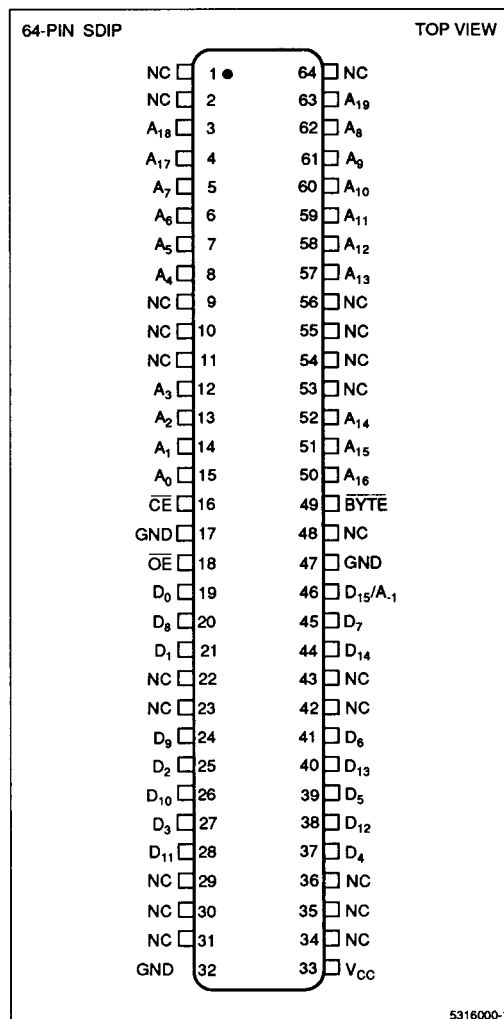


Figure 1. Pin Connections for SDIP Package

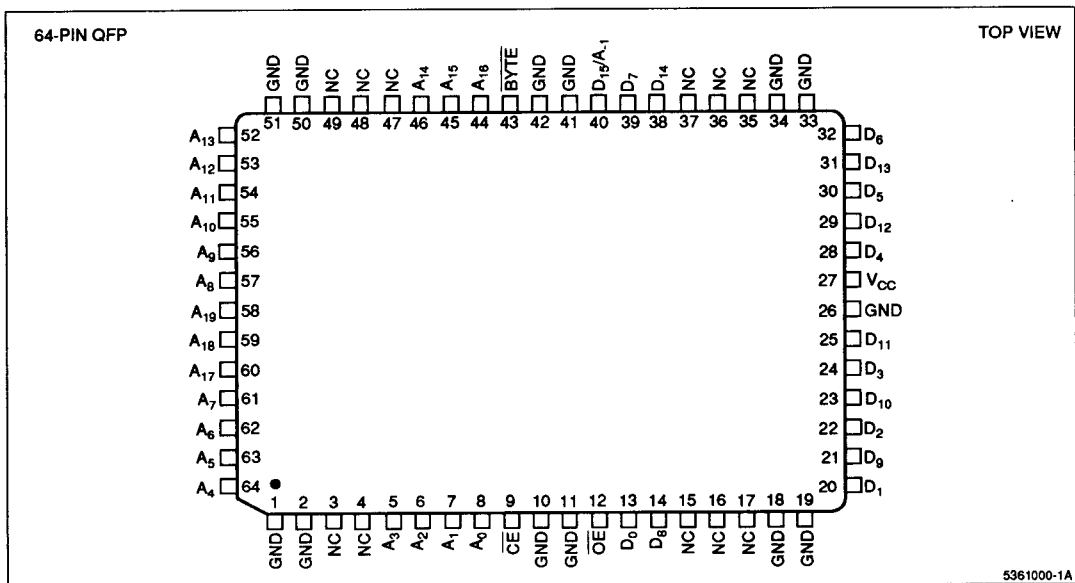


Figure 2. Pin Connections for QFP Package



| SIGNAL                           | PIN NAME                  | NOTE |
|----------------------------------|---------------------------|------|
| A <sub>1</sub>                   | Address Input (Byte Mode) | 1    |
| A <sub>0</sub> - A <sub>19</sub> | Address input             |      |
| D <sub>0</sub> - D <sub>15</sub> | Data output               |      |
| $\overline{\text{CE}}$           | Chip Enable input         |      |

| SIGNAL                   | PIN NAME            | NOTE |
|--------------------------|---------------------|------|
| $\overline{\text{OE}}$   | Output Enable input |      |
| $\overline{\text{BYTE}}$ | Byte/word switch    |      |
| V <sub>CC</sub>          | Power supply (+5 V) |      |
| GND                      | Ground              |      |

1. D<sub>15</sub>/A-1 pin becomes LSB address input (A-1) when the bit configuration is set in byte mode, and data output (D<sub>15</sub>) when in word mode. BYTE input pin selects bit configuration.

## TRUTH TABLE

| $\overline{CE}$ | $\overline{OE}$ | BYTE | A <sub>1</sub> | MODE         | D <sub>0</sub> - D <sub>7</sub>  | D <sub>8</sub> - D <sub>15</sub> | SUPPLY CURRENT               |
|-----------------|-----------------|------|----------------|--------------|----------------------------------|----------------------------------|------------------------------|
| H               | X               | X    | X              | Non selected | High-Z                           |                                  | Standby (I <sub>SB</sub> )   |
| L               | H               | X    | X              | Non selected | High-Z                           |                                  | Operating (I <sub>CC</sub> ) |
| L               | L               | H    | Inhibit        | Word         | D <sub>0</sub> - D <sub>7</sub>  | D <sub>8</sub> - D <sub>15</sub> | Operating (I <sub>CC</sub> ) |
| L               | L               | L    | L              | Byte         | D <sub>0</sub> - D <sub>7</sub>  | High-Z                           | Operating (I <sub>CC</sub> ) |
| L               | L               | L    | H              | Byte         | D <sub>8</sub> - D <sub>15</sub> | High-Z                           | Operating (I <sub>CC</sub> ) |

## NOTE:

X = H or L

## ABSOLUTE MAXIMUM RATINGS

| PARAMETER             | SYMBOL           | RATING                       | UNIT | NOTE |
|-----------------------|------------------|------------------------------|------|------|
| Supply voltage        | V <sub>CC</sub>  | -0.3 to +7.0                 | V    | 1    |
| Input voltage         | V <sub>IN</sub>  | -0.3 to V <sub>CC</sub> +0.3 | V    |      |
| Output voltage        | V <sub>OUT</sub> | -0.3 to V <sub>CC</sub> +0.3 | V    |      |
| Operating temperature | T <sub>opr</sub> | 0 to +70                     | °C   |      |
| Storage temperature   | T <sub>stg</sub> | -55 to +150                  | °C   |      |

## NOTE:

1. The maximum applicable voltage on any pin with respect to GND.

RECOMMENDED OPERATING CONDITIONS (T<sub>A</sub> = 0 to +70°C)

| PARAMETER      | SYMBOL          | MIN. | TYP. | MAX. | UNIT |
|----------------|-----------------|------|------|------|------|
| Supply voltage | V <sub>CC</sub> | 4.5  | 5.0  | 5.5  | V    |

DC CHARACTERISTICS (V<sub>CC</sub> = 5 V ± 10%, T<sub>A</sub> = 0 to +70°C)

| PARAMETER              | SYMBOL           | CONDITIONS                                | MIN. | MAX.                 | UNIT | NOTE |
|------------------------|------------------|-------------------------------------------|------|----------------------|------|------|
| Input "Low" voltage    | V <sub>IL</sub>  |                                           | -0.3 | 0.8                  | V    |      |
| Input "High" voltage   | V <sub>IH</sub>  |                                           | 2.2  | V <sub>CC</sub> +0.3 | V    |      |
| Output "Low" voltage   | V <sub>OL</sub>  | I <sub>OL</sub> = 2.0 mA                  |      | 0.4                  | V    |      |
| Output "High" voltage  | V <sub>OH</sub>  | I <sub>OH</sub> = -400 μA                 | 2.4  |                      | V    |      |
| Input leakage current  | I <sub>LI</sub>  | V <sub>IN</sub> = 0 V to V <sub>CC</sub>  |      | 10                   | μA   |      |
| Output leakage current | I <sub>LO</sub>  | V <sub>OUT</sub> = 0 V to V <sub>CC</sub> |      | 10                   | μA   | 1    |
| Operating current      | I <sub>CC1</sub> | t <sub>RC</sub> = 200 ns                  |      | 50                   | mA   | 2    |
|                        | I <sub>CC2</sub> | t <sub>RC</sub> = 1 μs                    |      | 40                   |      |      |
|                        | I <sub>CC3</sub> | t <sub>RC</sub> = 200 ns                  |      | 45                   | mA   | 3    |
|                        | I <sub>CC4</sub> | t <sub>RC</sub> = 1 μs                    |      | 35                   |      |      |
| Standby current        | I <sub>SB1</sub> | $\overline{CE} = V_{IH}$                  |      | 3                    | mA   |      |
|                        | I <sub>SB2</sub> | $\overline{CE} = V_{CC} - 0.2 V$          |      | 100                  |      |      |

## NOTES:

1.  $\overline{CE} / \overline{OE} = V_{IH}$ .
2. V<sub>IN</sub> = V<sub>IH</sub>/V<sub>IL</sub>,  $\overline{CE} = V_{IL}$ , outputs open.
3. V<sub>IN</sub> = (V<sub>CC</sub> - 0.2 V) or 0.2 V,  $\overline{CE} = 0.2 V$ , outputs open.

# AC CHARACTERISTICS (V<sub>CC</sub> = 5 V ± 10%, T<sub>A</sub> = 0 to +70°C)

| PARAMETER              | SYMBOL           | MIN. | MAX. | UNIT | NOTE |
|------------------------|------------------|------|------|------|------|
| Read cycle time        | t <sub>RC</sub>  | 200  |      | ns   |      |
| Address access time    | t <sub>AA</sub>  |      | 200  | ns   |      |
| Chip enable time       | t <sub>ACE</sub> |      | 200  | ns   |      |
| Output enable time     | t <sub>OE</sub>  |      | 80   | ns   |      |
| Output hold time       | t <sub>OH</sub>  | 5    |      | ns   |      |
| CE to output in High-Z | t <sub>CHZ</sub> |      | 70   | ns   | 1    |
| OE to output in High-Z | t <sub>OHZ</sub> |      | 70   | ns   |      |

## NOTE:

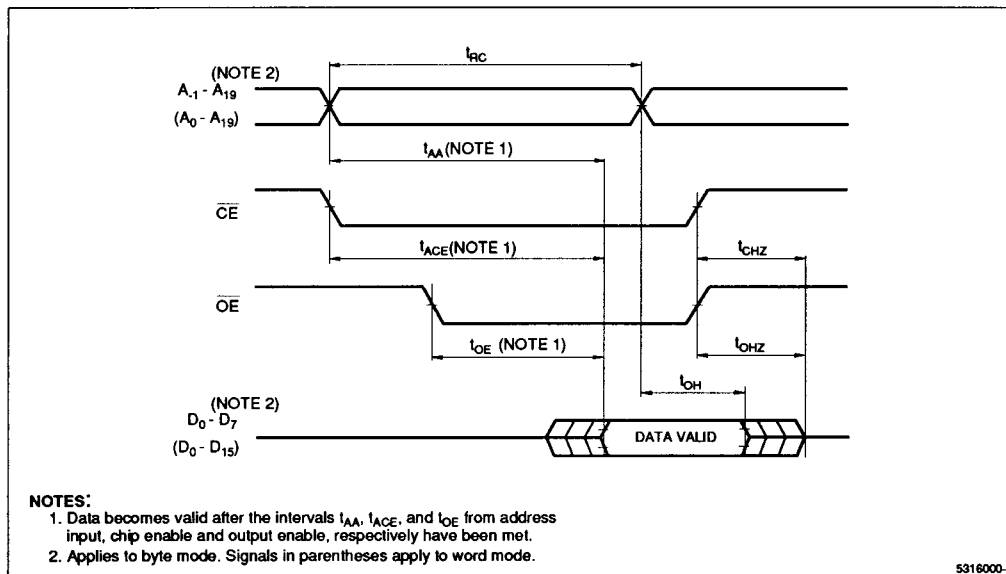
1. This is the time required for the outputs to become high-impedance.

# AC TEST CONDITIONS

| PARAMETER               | RATING          |
|-------------------------|-----------------|
| Input voltage amplitude | 0.6 V to 2.4 V  |
| Input rise/fall time    | 10 ns           |
| Input reference level   | 1.5 V           |
| Output reference level  | 0.8 V and 2.2 V |
| Output load condition   | 1TTL +100 pF    |

# CAPACITANCE (V<sub>CC</sub> = 5 V ± 10%, f = 1 MHz, T<sub>A</sub> = 25°C)

| PARAMETER          | SYMBOL           | MIN. | TYP. | MAX. | UNIT |
|--------------------|------------------|------|------|------|------|
| Input capacitance  | C <sub>IN</sub>  |      |      | 10   | pF   |
| Output capacitance | C <sub>OUT</sub> |      |      | 10   | pF   |



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Figure 4. Timing Diagram

## CAUTION

To stabilize the power supply, it is recommended that a high-frequency bypass capacitor be connected between the V<sub>CC</sub> pin and GND.

## ORDERING INFORMATION

